Status of the Jason-2 GDR Precision Orbit Ephemerides

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Precise Orbit Determination

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Orbits comparison: radial component

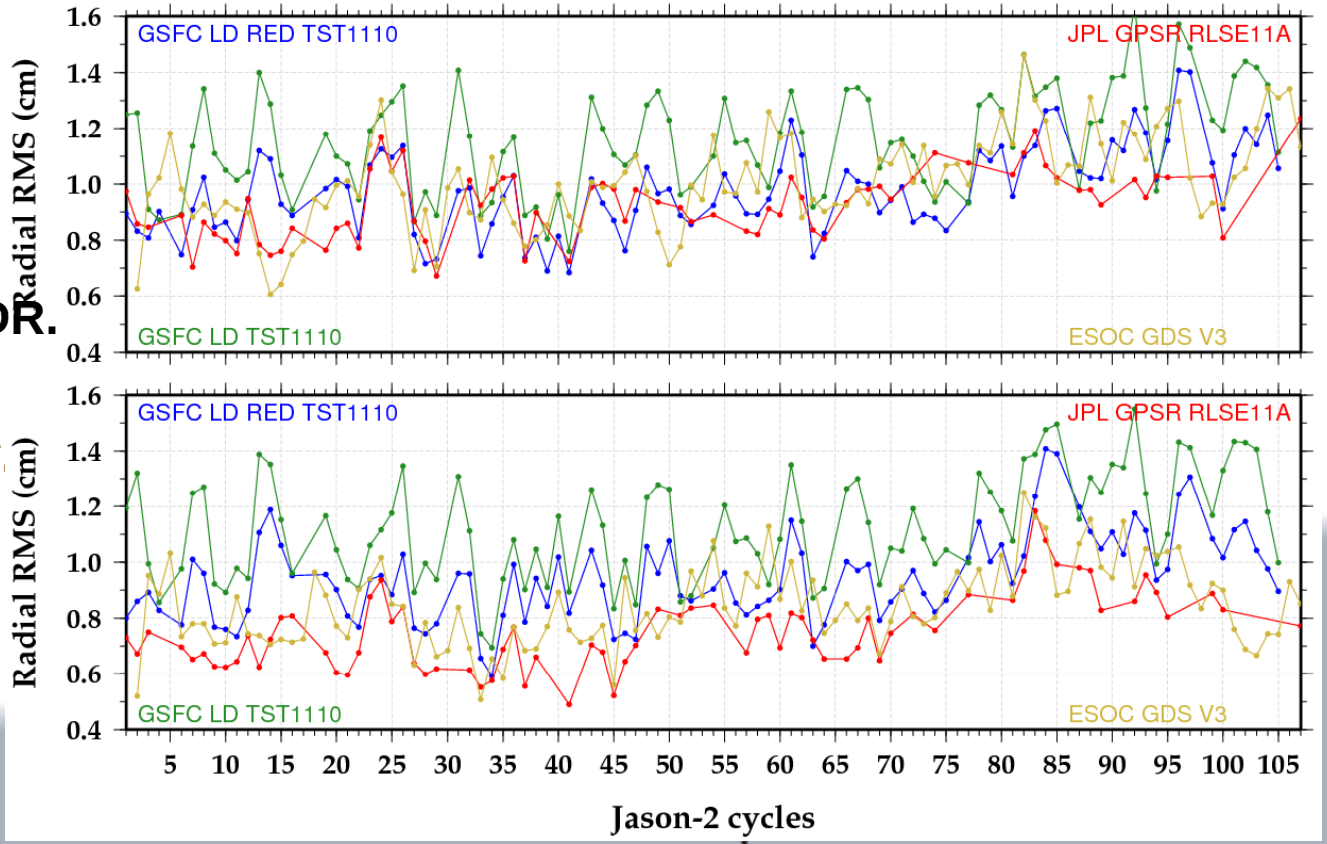
- **RMS of radial orbit differences relative to the GDR/GDR-D* solutions**

GDR – others:

- **Similar behavior in GSFC & JPL reduced dynamic solutions when compared to GDR.**

GDR-D* – others:

- **JPL close to GDR-D***
- ***60-day* signal btwn GSFC & GDR/GDR-D* dynamic orbits.**
- ***~1-cm* agreement.**



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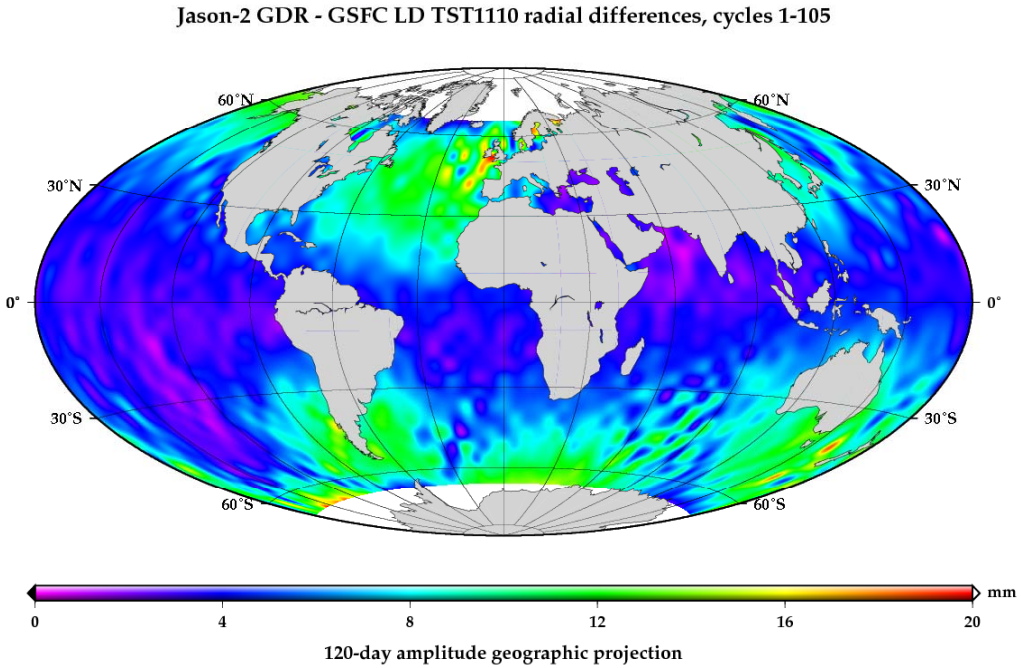
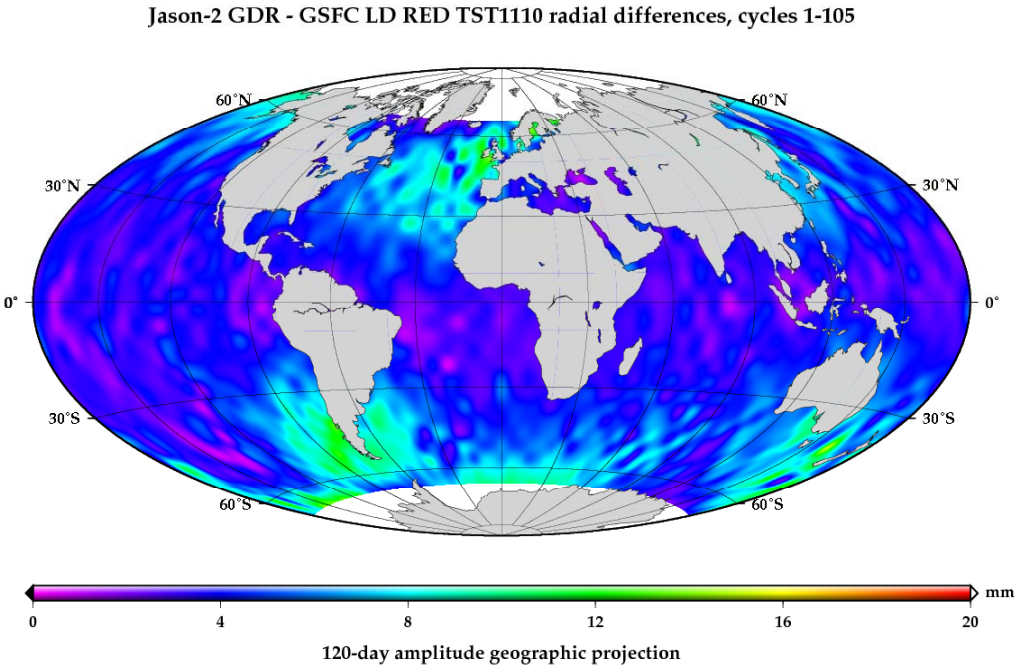
120-day geographically correlated radial signal

- **Typical signature of SRP model differences locally exceeding *1-cm***

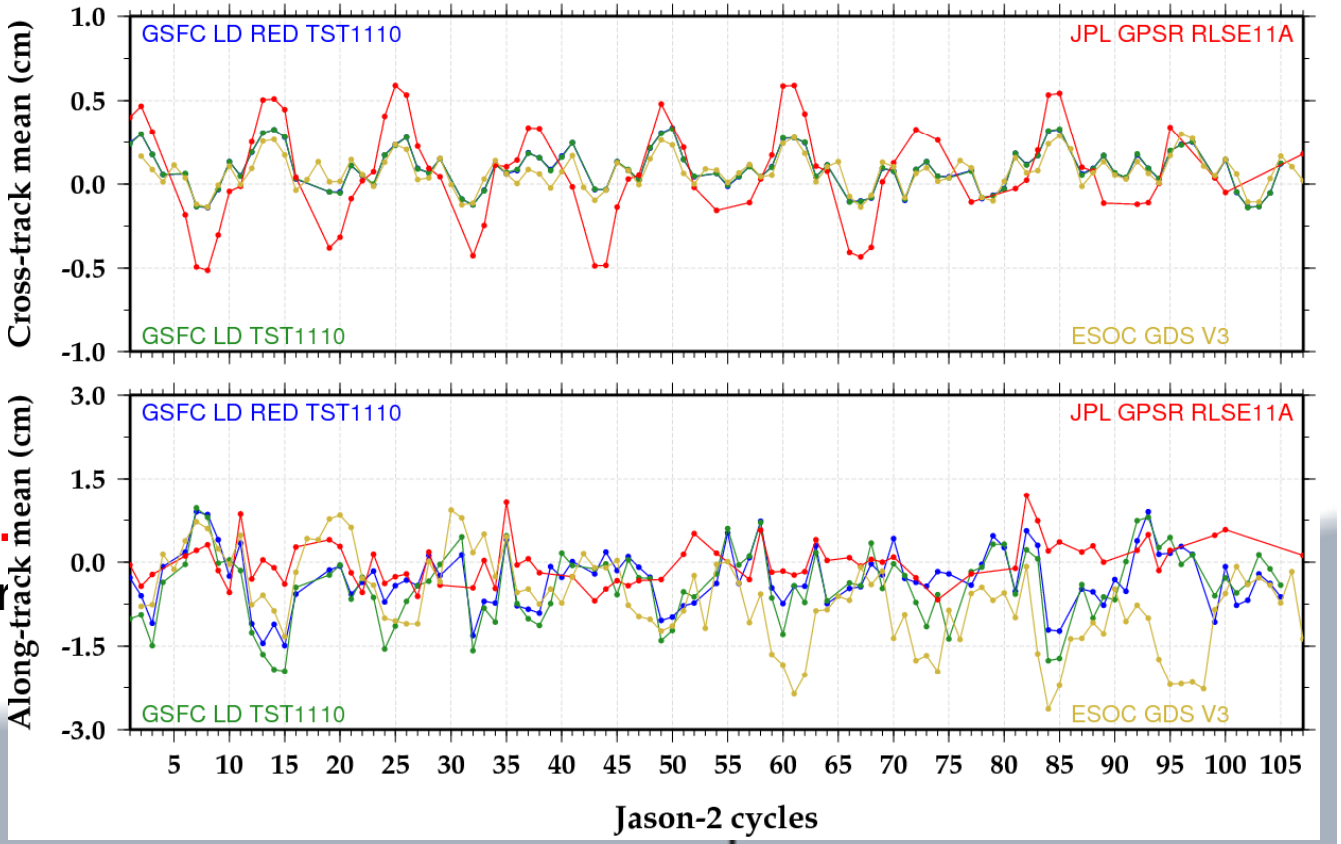




- **GSFC reduced dynamic solution compensates for mismodeled SRP?**

Orbits comparison: cross/along-track components

- **Mean of cross/along-track differences relative to the CNES solution**
  - **Lowering of the last year cross-track Beta-prime dependent signature between GSFC & CNES orbits.**
  - **No more along-track divergence between JPL & CNES solutions.**
  - **ESOC change similar to JPL10A GPS-based orbit degradation?**



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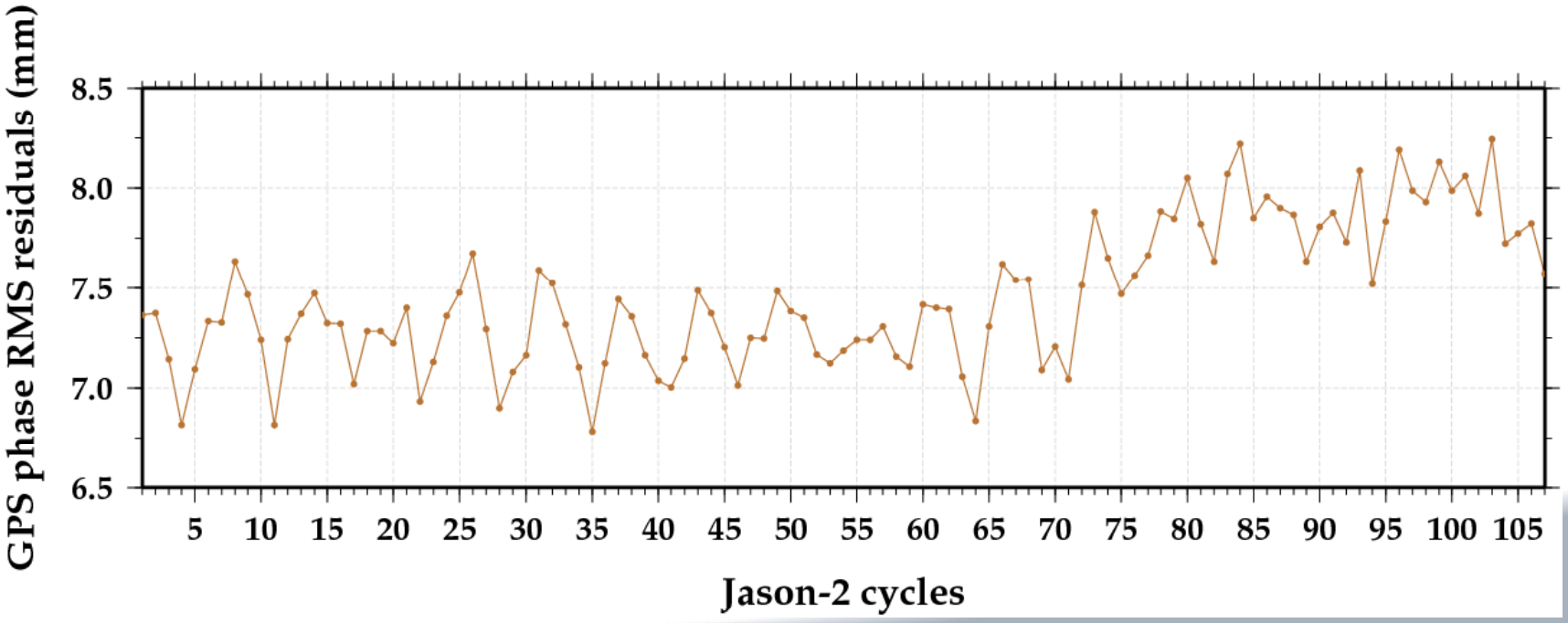
Observed GPS-related degradation on CNES side

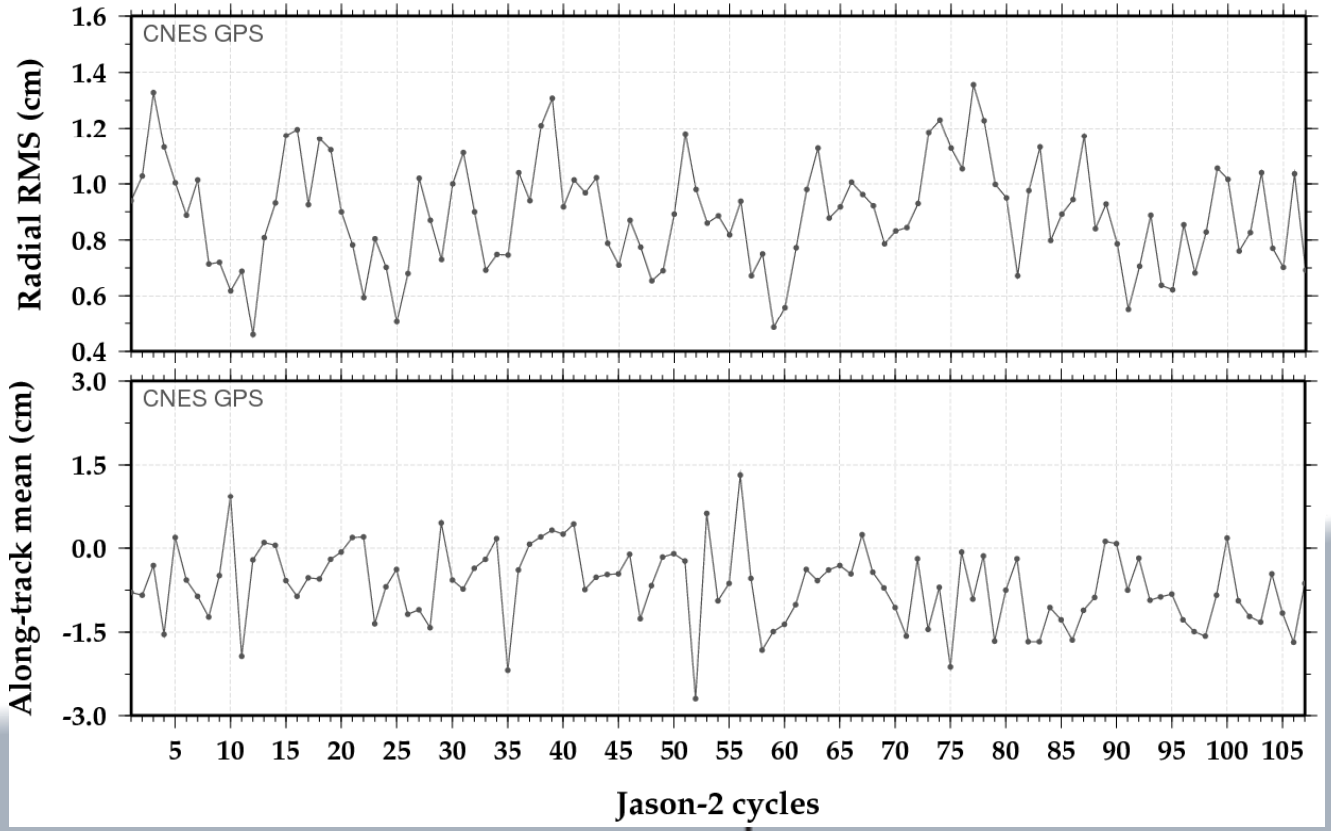
- **RMS of GPS phase post-fit residuals for the CNES solution**



- ***~1-mm* increase after the cycles 50.**

How is CNES GPS-based dynamic solution affected?

- **CNES GPS orbit differences relative to the CNES DORIS solution**
  - **No visible CNES GPS orbit degradation due to this effect.**
  - **Likely reasons:**
    - Solution more dynamically constrained.
    - Rather conservative editing of the cycle slips.



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Orbits comparison: Z-centering

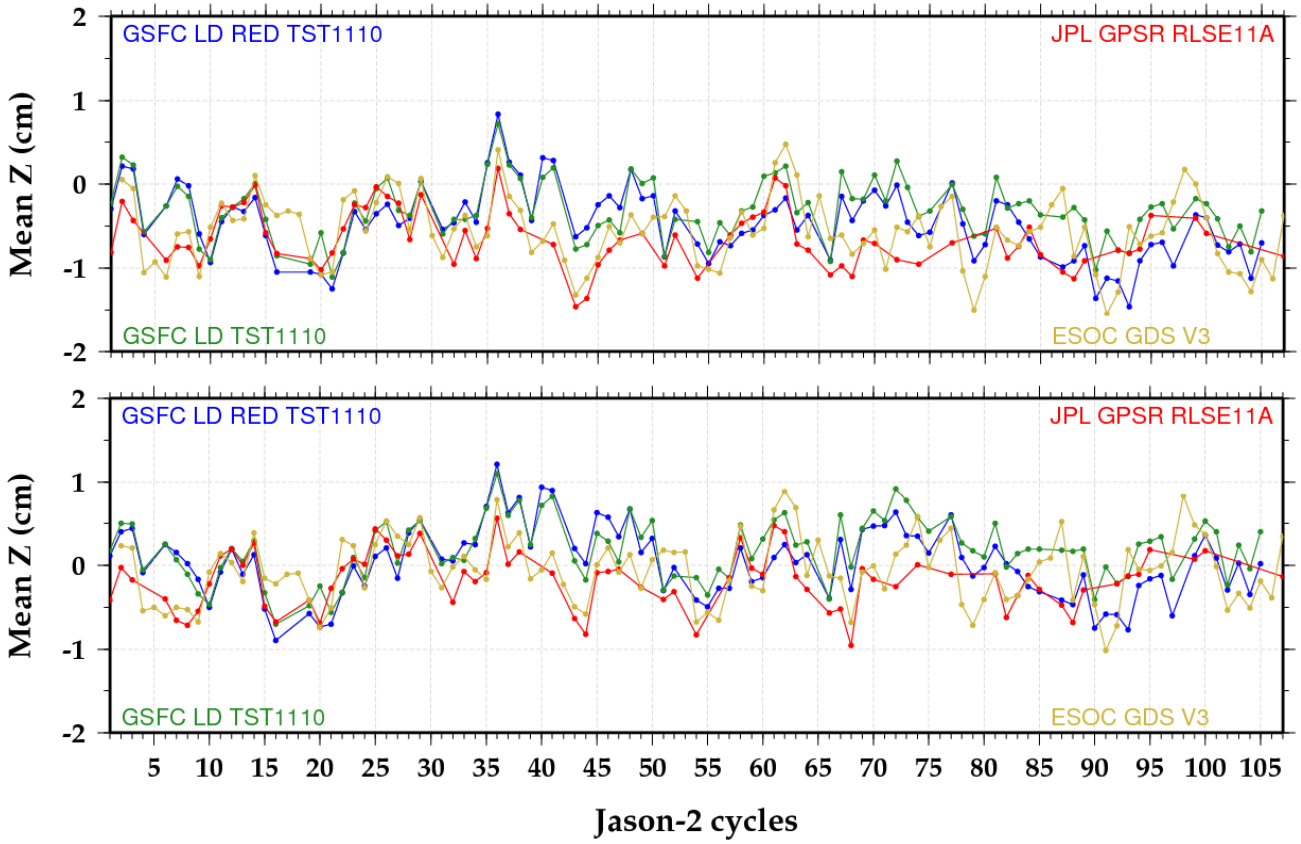
■ **Mean of Z orbit differences**

GDR – others:

- **Expected *-5 mm* Z-shift between GDR (ITRF2005) & others (ITRF2008).**

GDR-D* – others:

- **Strong SLR weight in CNES orbits brings GDR-D* (ITRF2008) to GSFC L+D Z-level.**



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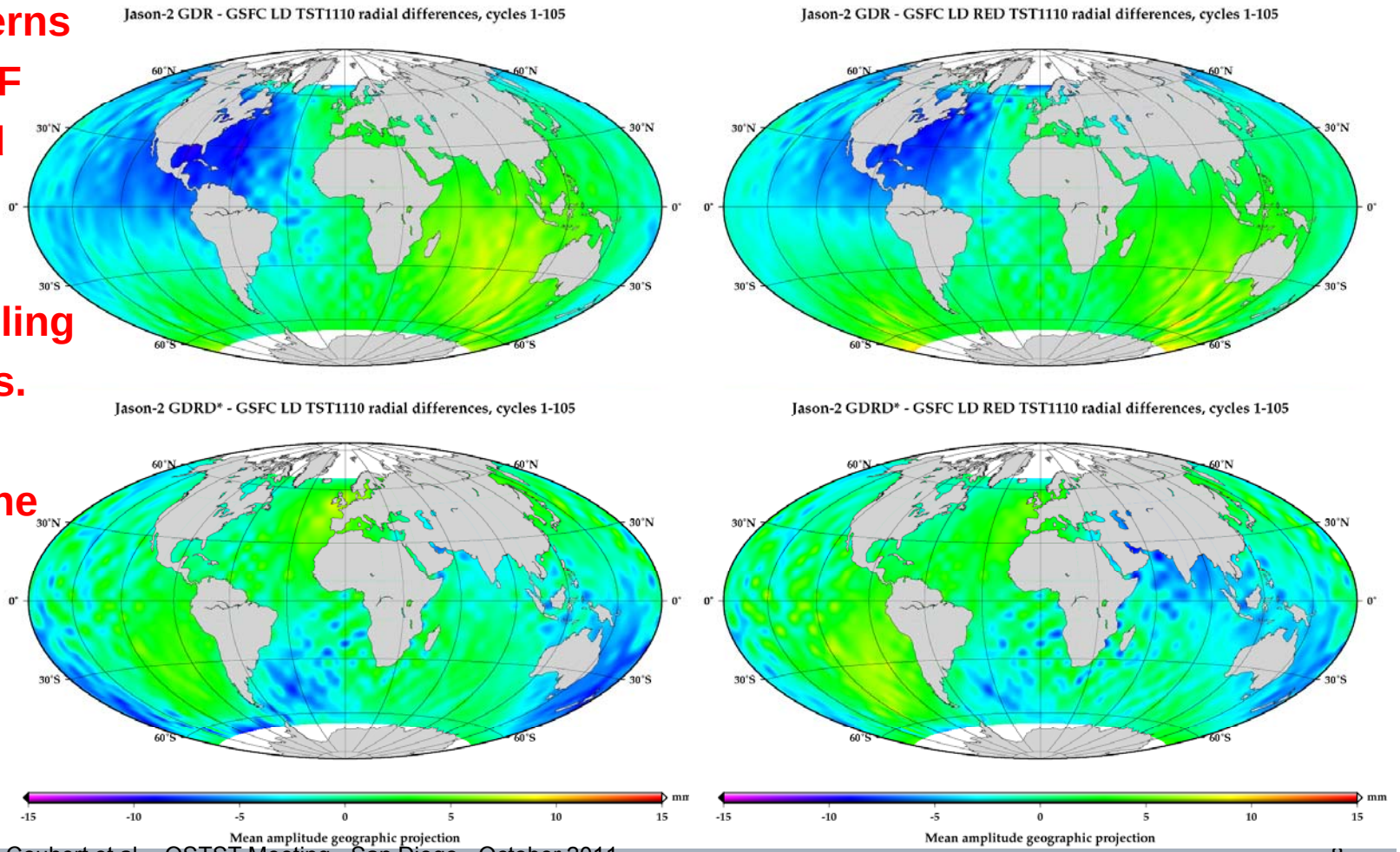
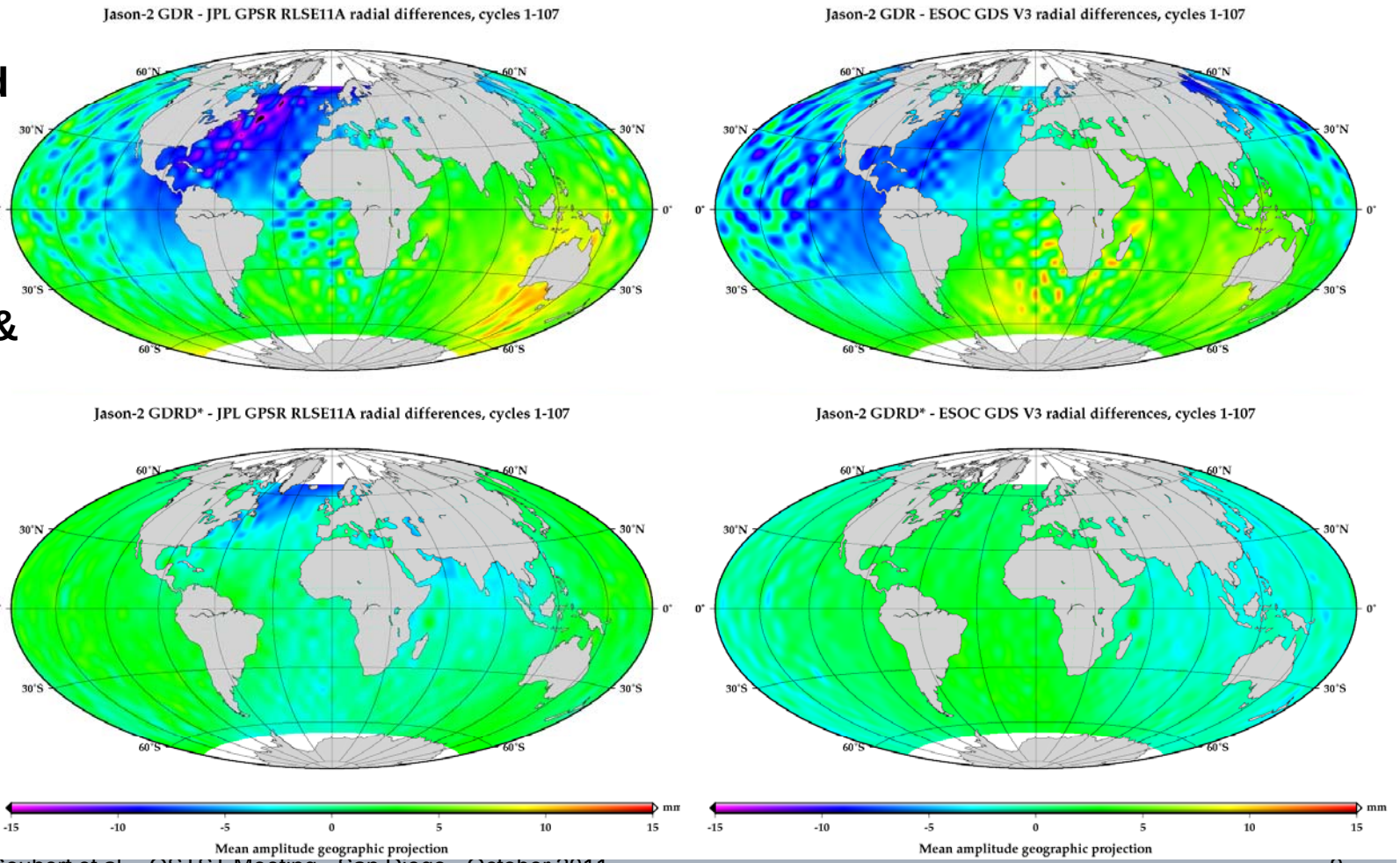
Mean geographically correlated radial differences (1/2)

- **Comparison between GDR/GDR-D* & GSFC LD/LD RED**
  - **N/S patterns due to ITRF Z-shift and E/W ones to gravity field modeling differences.**
  - **GDR-D* removes the N/S & E/W patterns.**



Mean geographically correlated radial differences (2/2)

- **Comparison between GDR/GDR-D* & JPL/ESOC**
  - **Obvious gravity field modeling differences signatures btwn GDR & JPL/ESOC.**
  - **GDR-D* completely clears the signatures.**



Orbits comparison: Y-centering

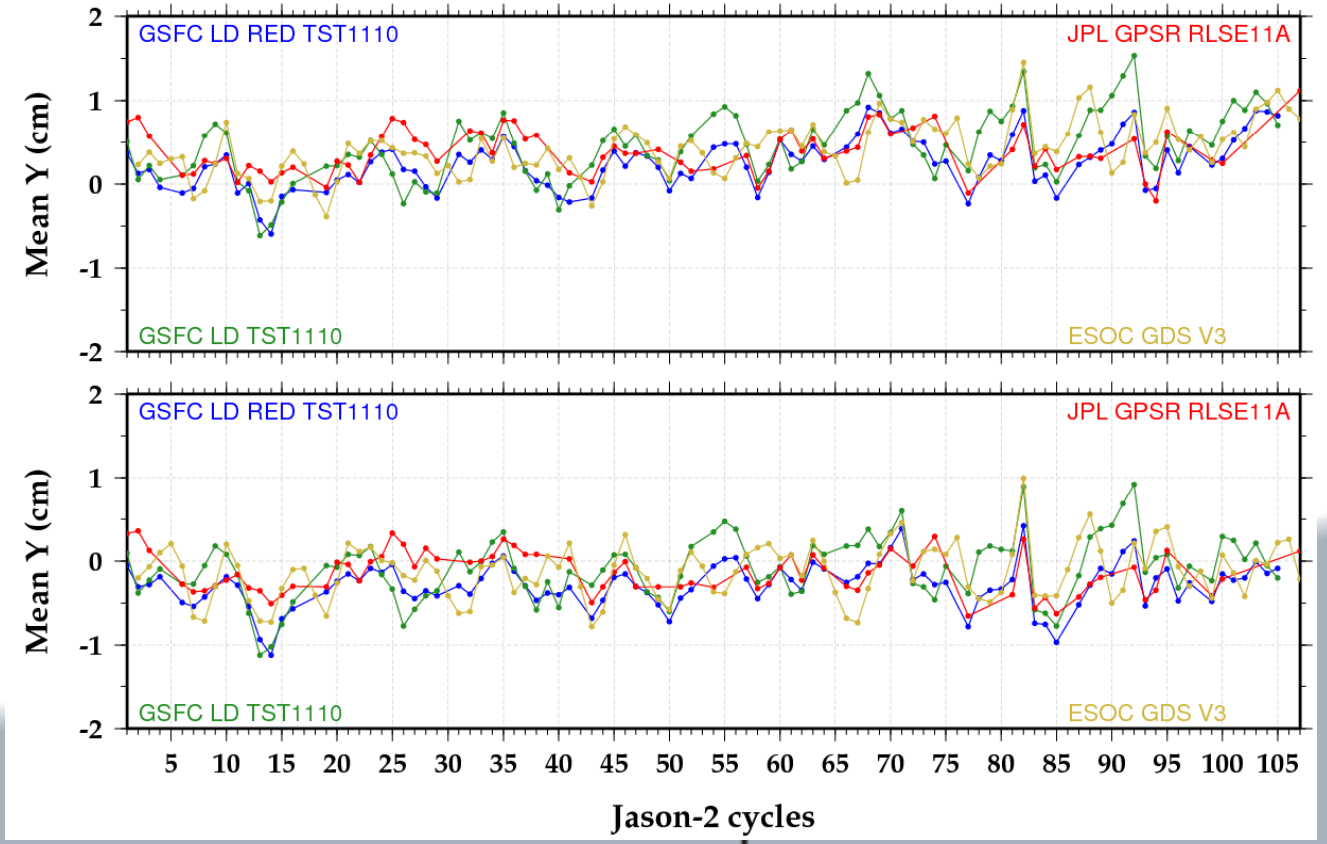
■ **Mean of Y orbit differences**

GDR – others:

- **Y-drift between GDR & GSFC/ESOC dynamic orbits.**

GDR-D* – others:

- **Using the GDR-D* standard cancels the Y-drift.**



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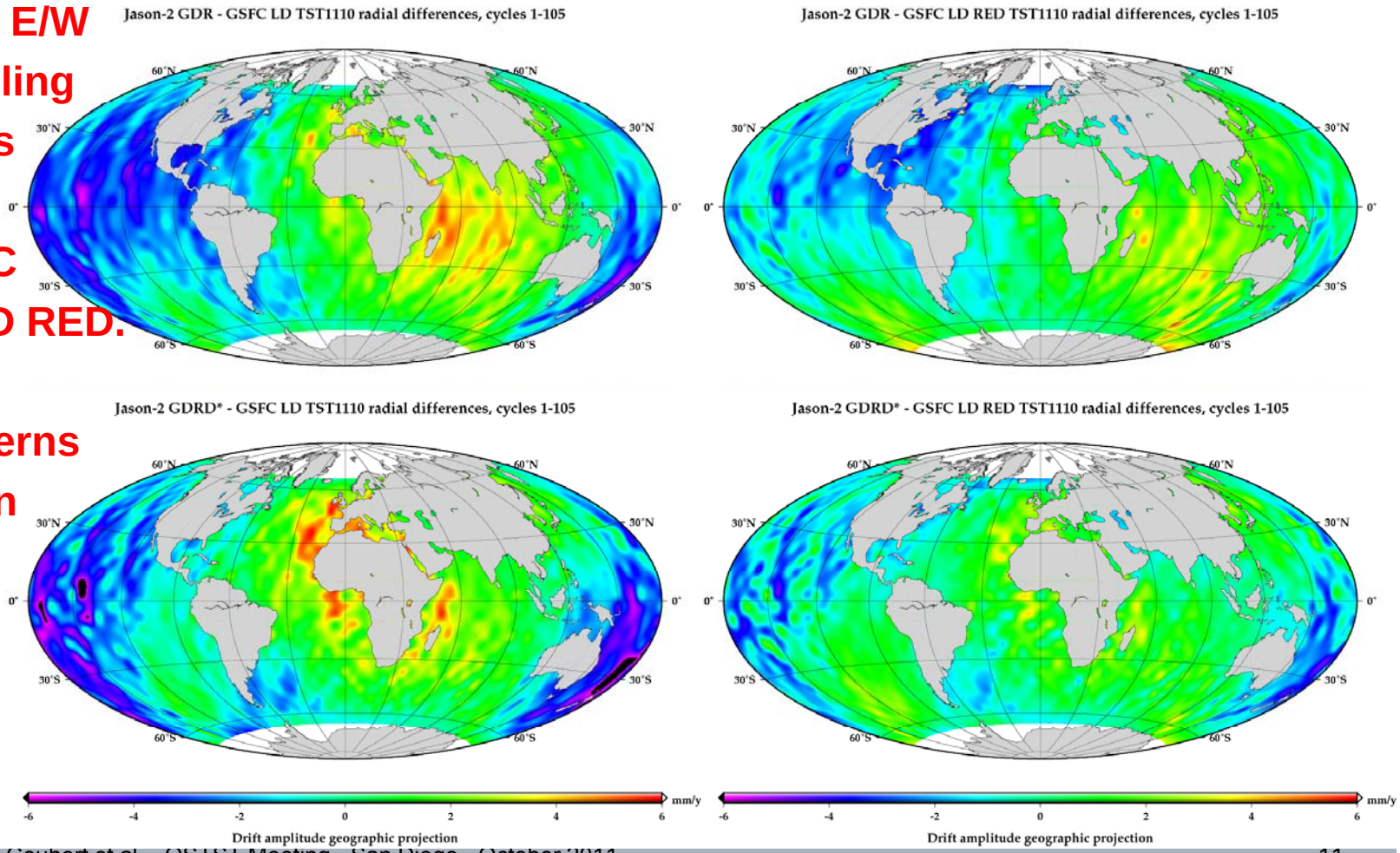
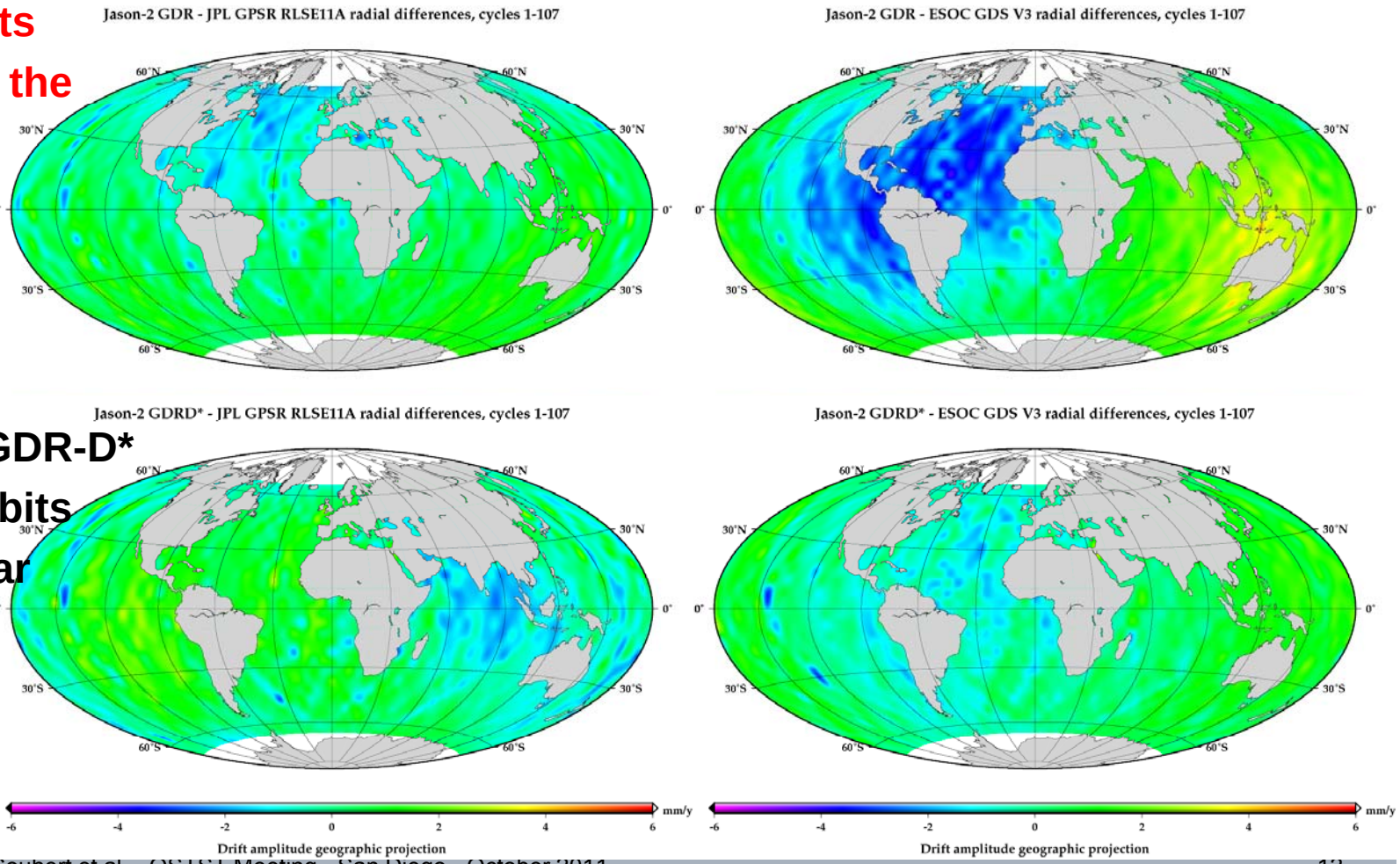
Geographically correlated radial differences drifts (1/2)

- **Comparison between GDR/GDR-D* & GSFC LD/LD RED**
  - **Stronger E/W TVG modeling differences patterns w.r.t. GSFC LD than LD RED.**
  - **E/W patterns attenuation with GDR-D*.**



Geographically correlated radial differences drifts (2/2)

- **Comparison between GDR/GDR-D* & JPL/ESOC**
  - **JPL's drifts compare at the same level as CNES solutions drifts.**
  - **ESOC & GDR-D* dynamic orbits apply similar TVG drifts.**



SLR core network stations performance

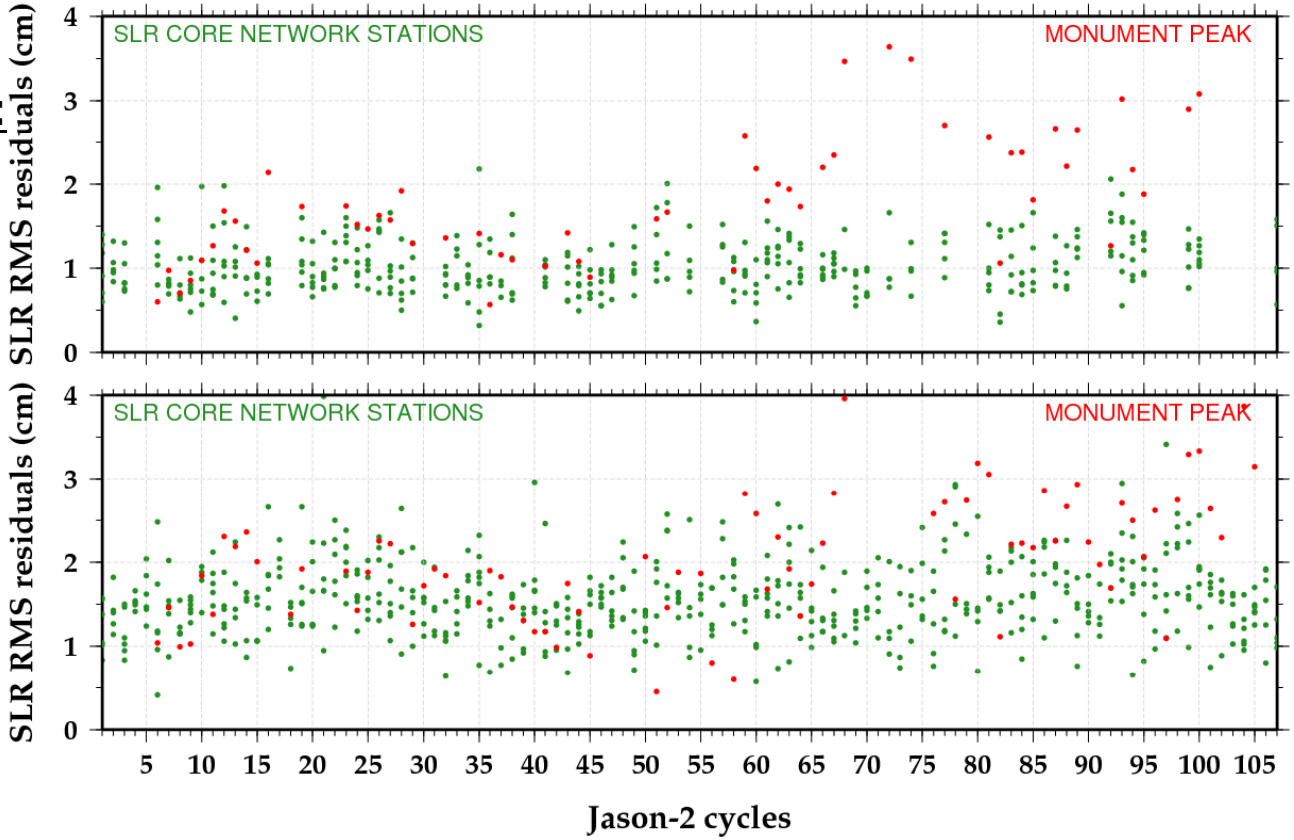
- **All elevations stations residuals on independent GPS-derived orbits**

JPL GPS-based reduced dynamic orbit:

- **CN SLR candidates – Mcdo,Yarr,Wash, Monu,Zimm,Graz,Hers.**

CNES GPS-based dynamic solution:

- **JPL orbit shows better low elevation SLR residuals.**
- **Monu taken off CN.**



SLR validation of the different orbit solutions

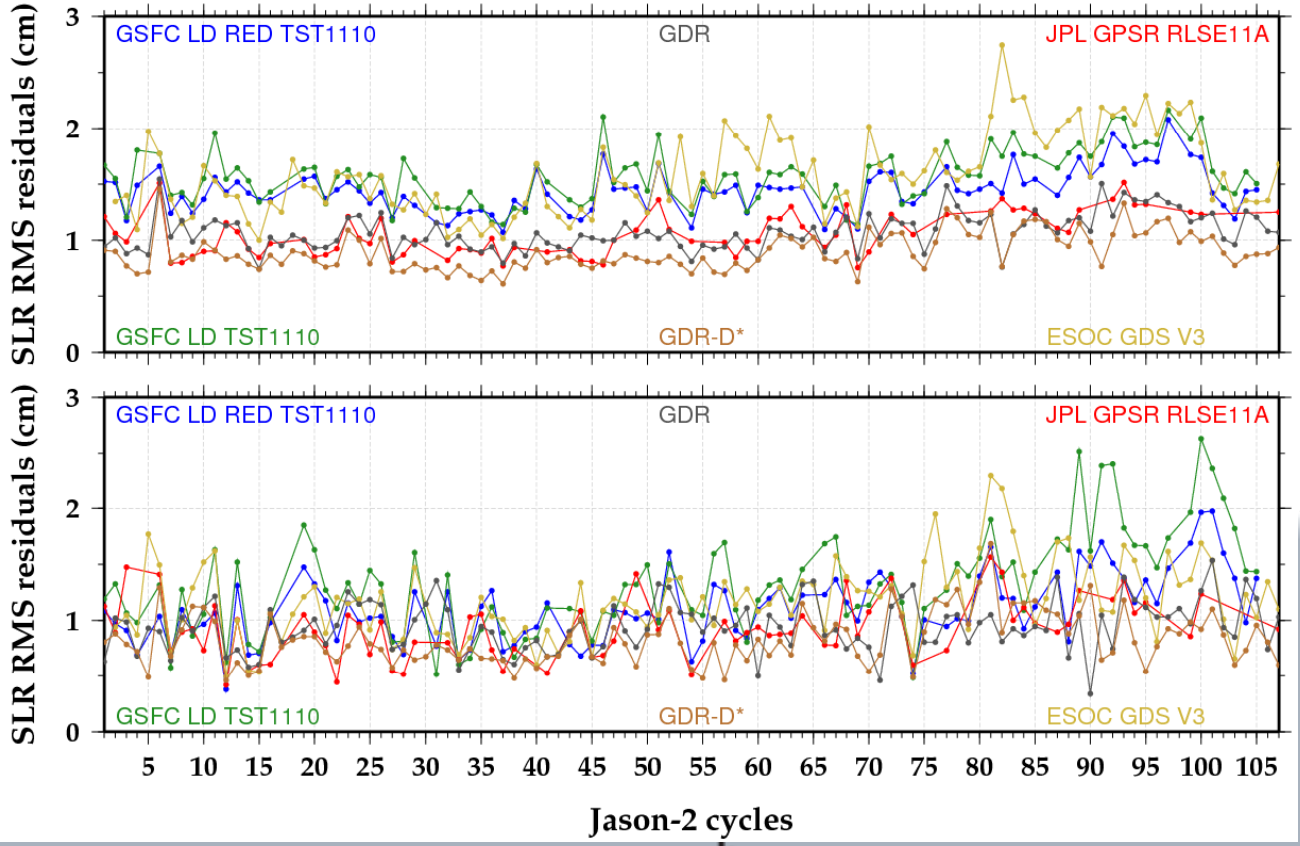
- **RMS of SLR residuals on core network**

  All elevations:

  - **Reduced dynamic orbits perform better.**
  - **SLR used in the GDR/GDR-D* orbits.**

  Above *70 °*:

  - ***~1-cm* radial orbits accuracy.**
  - **GPS and SLR Monu degradation explain the late increase?**



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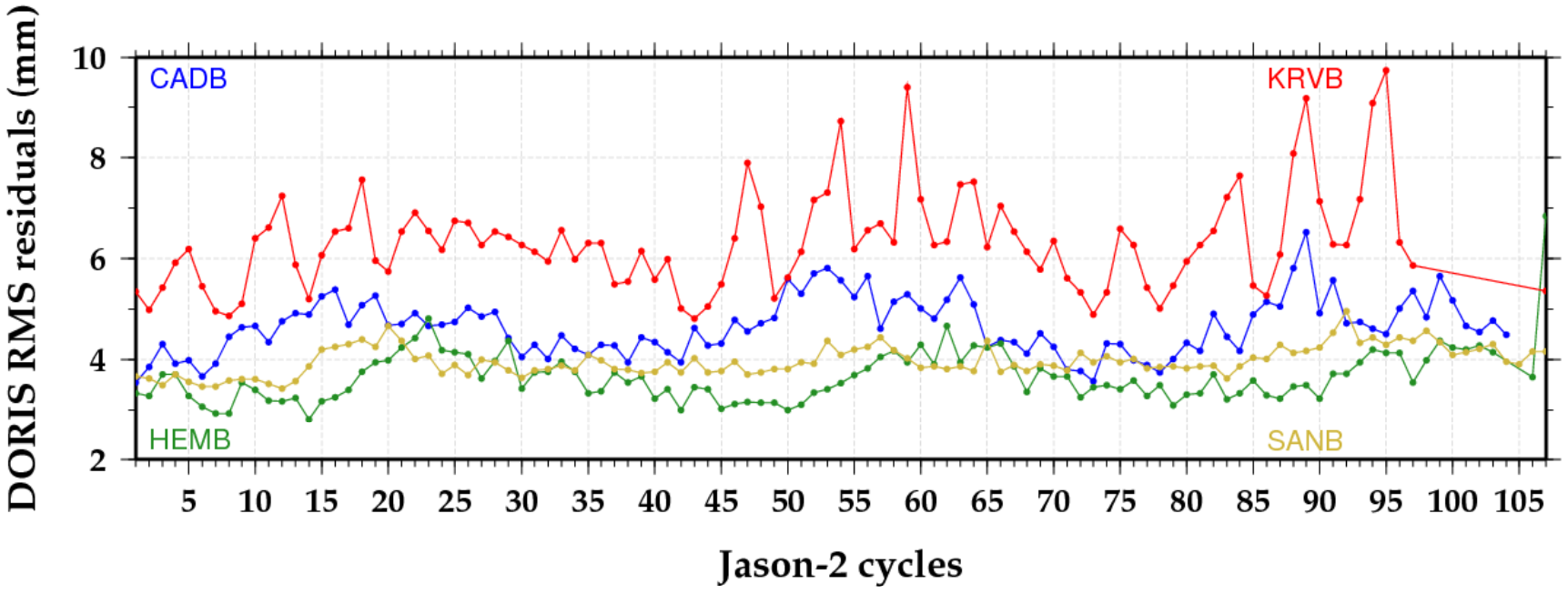
Monitoring of the SAA effect on DORIS residuals

■ **RMS of DORIS post-fit residuals on the GDR solution**



◆ **No conclusive sign of degradation on typical SAA beacons.**

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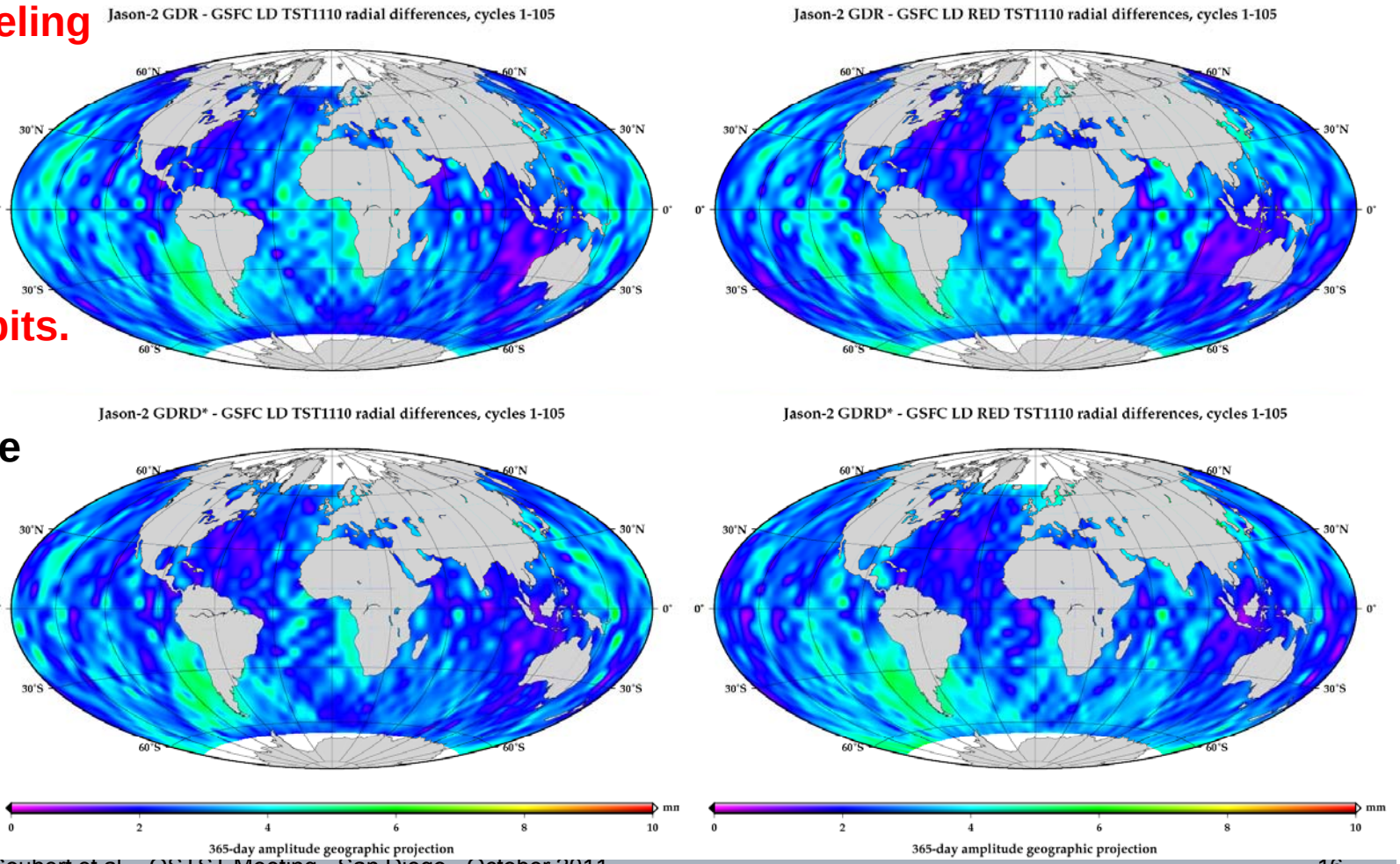
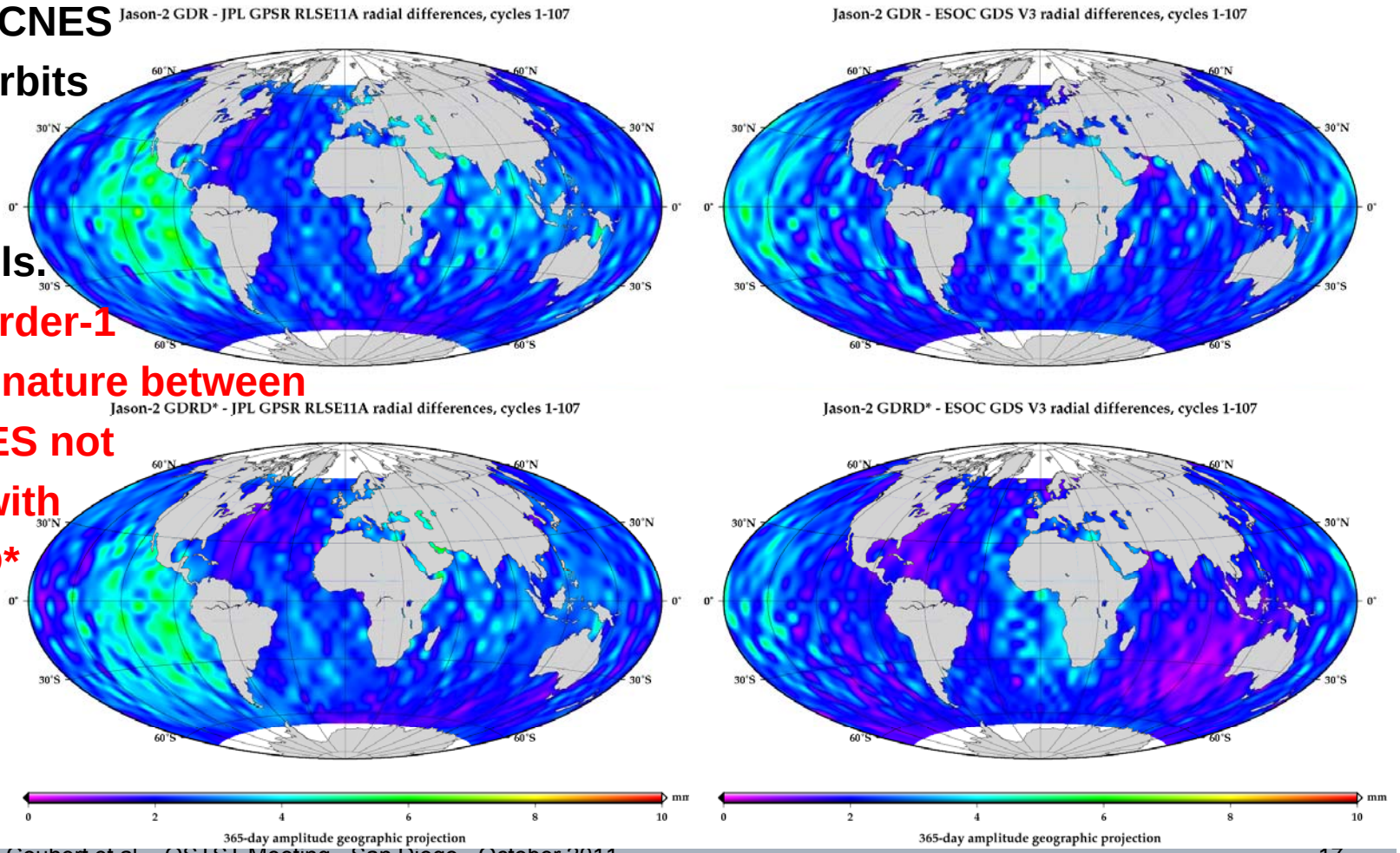
Annual geographically correlated radial signal (1/2)

- **Comparison between GDR/GDR-D* & GSFC LD/LD RED**
  - **TVG modeling differences signatures common to GSFC LD & LD RED orbits.**
  - **No change w.r.t the GDR-D* standard.**



Annual geographically correlated radial signal (2/2)

- **Comparison between GDR/GDR-D* & JPL/ESOC**
  - **ESOC & CNES dynamic orbits use very similar TVG models.**
  - ***~6-mm* order-1 type of signature between JPL & CNES not removed with the GDR-D* standard.**



Summary

- **Overall ~*1-cm* stable Jason-2 radial orbit accuracy.**
- **Typical SRP signatures in comparison with GSFC dynamic solution.**
- **No conclusive sign of degradation in GDR/GDR-D* solutions in relation with the GPS receiver behavior.**
- **Attenuation of N/S and E/W patterns in geographically correlated radial orbit differences with respect to other solutions when using the GDR-D* standard.**
- **Monument Peak SLR degradation.**
- **Persistent annual geographically correlated radial signals observed between the different orbits (needs to be further investigated).**

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Backup slides

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Jason-2 orbits comparison: cross/along-track components

- **Mean of cross/along-track differences relative to the GDR solution**

Other typical SRP modeling differences between GSFC, JPL and CNES.

Along-track divergence between JPL10A and GDR after the 50s cycles?